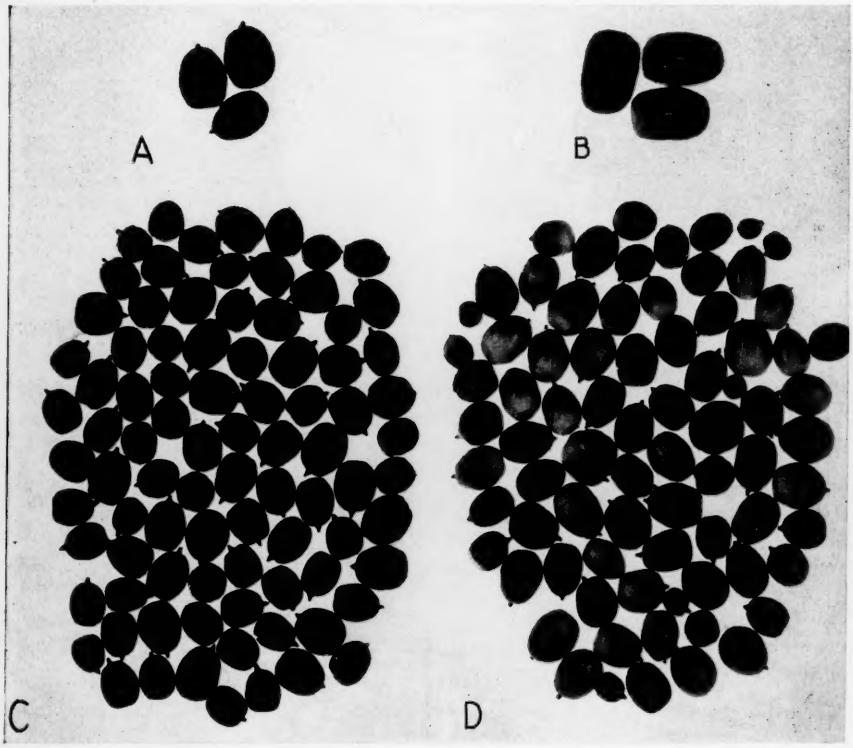
The Journal of HEREDITY



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Development of Population Policies

The "Talpid Lethal" Gene in the Fowl

Relationship Between Body-Size and Twinning

Psychological Factors in Determining Family Size

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The American Genetic Association

An incorporated organization devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks

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The

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"TALPID" EMBRYOS

Figure 1

The "talpid" lethal gene causes characteristic changes in the development of embryos. An eleven-day-old talpid embryo is shown at *A* compared with a normal embryo of the same age (*B*). Note the subcutaneous edema over thigh and neck regions, the external viscera (ectopia) and the shape of the limbs. Talpid (*C*) and normal (*D*) fourteen-day-old embryos are shown below. The failure in development of the facial region and of the lower beak is characteristic of this lethal syndrome.

THE "TALPID LETHAL" IN THE DOMESTIC FOWL

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OCCASIONALLY, in fowl breeding, especially in the mating of closely related individuals, low hatchability presents a problem of importance. The investigator is apt to assign such poor results to the peculiarities of the particular breeding birds involved. Usually no definite changes can be observed among the dead embryos which would suggest the cause of the difficulty. There are times, however, when a routine examination of all eggs which fail to hatch uncovers a cause for the reduced hatchability. The frequent appearance of embryos showing similar abnormalities of development or form immediately suggests a lethal character. Unquestionably, many of the other cases of low hatchability are due to the action of lethal genes, but unless anatomical structures are involved such characters usually escape detection. By suitable genetic tests it is a relatively simple procedure to eliminate a lethal gene which produces a visible abnormality from a stock which otherwise might be of considerable value.

Origin of the Lethal

In 1935 a system of pedigree hatching and record keeping was developed to include the observations on all eggs which failed to hatch. The approximate age at death and any abnormality of development or position was recorded for each dead embryo. Thus, this system is designed specifically to identify genetic lethal characters.

As a consequence, the lethal described in this paper and known in this laboratory as the "Talpid* Lethal" was first recognized as such in the spring of 1936. In a mating of a sire to his daughters, several similarly abnormal embryos were observed. A review of the incubation records for the previous year (1935) when this same sire was also mated to some of his own daughters revealed descriptions of two abnormal embryos which unquestionably were talpid lethals. A total of eight daughters mated to their sire, Z325, were identified as carriers of the lethal. The gene has been bred into other stocks at will and the birds which are heterozygous for the lethal gene are easily identified by suitable genetic tests. The general procedure has been to mate a known carrier male with several unrelated females. When the progeny from such a mating are backcrossed to their parents, approximately one-half of them prove to carry the lethal gene.

In 1937, in a different mating of White Leghorns hatched in 1935, four embryos dying on about the eleventh day of incubation appeared to be identical with the talpid lethal observed in the previous year in distantly related stock. Later genetic tests showed that the same lethal gene was involved in both instances. The hen breeder (C439) had a hatchability of only 46.2 per cent of 26 fertile eggs. Only a portion of this reduction in hatchability can be assigned to the lethal. A full sister (C1839) did not carry the lethal and when mated to the same sire had a hatchability of 100 per cent of 12 fertile eggs. A study of the pedigrees of the birds known to carry the lethal revealed that the first common ancestor was a sire (S4475) hatched in 1927. Barring a duplicate mutation, which seems rather unlikely in this instance, the lethal gene must have been present in the stock and probably reduced hatchability in certain matings for at least eight years previous to its recognition as a lethal. The routine examination of all eggs which fail to hatch was begun in 1935, at which time lethal embryos of this type were first observed.

*From the Latin word, *talpa*, meaning mole, since the wings and especially the feet of the lethals resemble the forefeet of moles.

Description of the Character

The lethal embryos (Figures 1 and 2) are characterized by marked changes in anatomical development, of which those affecting the appendages seem more apparent. The most striking feature is the marked reduction in the length of the proximal bones of the leg and wing, while at the same time there is a duplication of the distal bones. In one foot there may be as many as nine or ten digits fused together or connected by webbing so that the foot resembles a cupped, many-fingered hand (Figure 1*C*). Similar duplications of the digits in the wing produce a structure which also resembles a hand (Figure 2 *B*), although the individuality of the digits is not so apparent. The entire vertebral column is shortened. Extreme ectopia, more prominent in the older talpid embryos (Figure 1*C*), and subcutaneous edema are also quite characteristic, the edema often resulting in large blebs over the thigh region and on the head and neck (Figure 1*A*). The development of the face and the inferior maxilla is considerably retarded. The development of the eyes, external ear, and comb appears to be normal. There is also a marked reduction in the development of the feather papillae. They are visible in a 11- or 12-day-old talpid (Figure 1*A*). but fail to develop to any great extent by the 17th day. If the embryo is genetically colored, some pigment is visible in the feather papillae on the 16th or 17th day. No actual feather development has been observed (Figure 2*B*). Compared to normal development, the talpids are much retarded and the difference is most obvious between older embryos.

The talpid embryos usually die about the 8th to 10th day of incubation. In certain matings, possibly due to hybrid vigor, a few such embryos will live much longer, 17 days being the maximum observed so far. The character can be recognized as early as four days by changes in the form of the limb buds. Normally, the limb buds are slightly elongated and bluntly rounded. In the talpids, the limb buds appear similar to a mid-saggital section through the stem and cap of a small toadstool. Figure 2*A* shows this characteristic in an eight-day-old embryo. Birds heterozygous for the character show no abnormality of external structures nor any change in the osteology of the limbs.

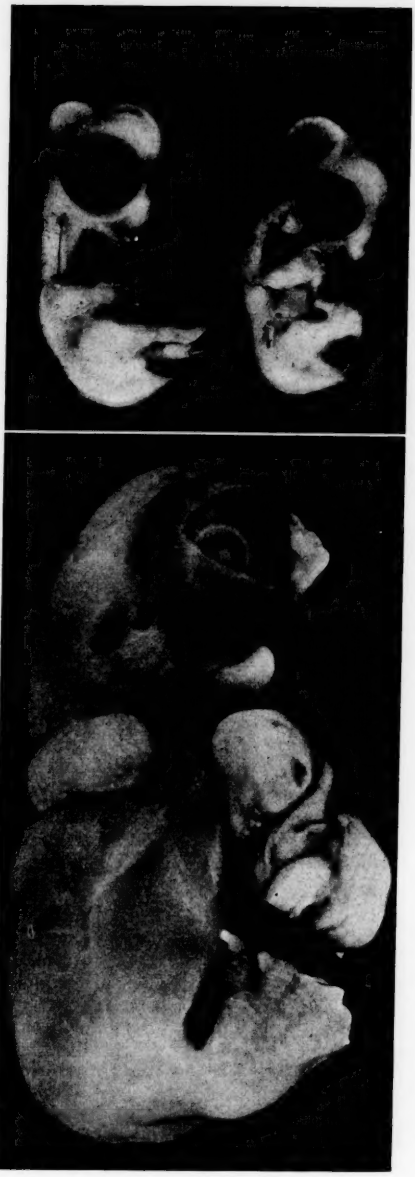
Genetics of the Character

The talpid lethal is inherited as a simple autosomal recessive character for which the symbol *ta* is suggested. Some of the talpid embryos die before 4½ days and hence there is a deficiency of lethals among the classifiable embryos. The data used for the determination of the mode of inheritance of the character are presented in Table I.

When all matings in which 95 per cent or more of the embryos could be classified for the lethal are grouped together, 23.6 per cent of the 415 eggs from those matings produced talpid lethal embryos. This figure does not differ significantly from a 3:1 ratio for a sim-

TABLE I. Incidence of the Talpid Lethal in Matings of Carrier by Carrier.

		Fertile eggs	Classifiable embryos	Talpid lethals	Talpids among: Total embryos	Talpids among: Classifiable embryos	Early dead embryos
		Number	Number	Number	Per cent	Per cent	Per cent
Total (all matings):		1886	1619	314	16.6	19.4	14.2
In matings where unclassified embryos were:							
	0 per cent	180	180	39	21.7	21.7	0
(cumulative)	<5 per cent	424	415	98	23.1	23.6	2.1
	<10 per cent	817	779	169	20.7	21.7	4.7
	<15 per cent	1154	1073	230	19.9	21.4	7.0



EIGHT-DAY AND 17-DAY TALPIDS
Figure 2

The shape of the fore and hind limbs of the eight-day talpid *A* (right) is already obviously different from the normal *A* (left). In the seventeen-day talpid (*B*) the feather development is deficient and the eye is very abnormal. The characteristic foot and "wing" condition show the marked mole-like form which gives the gene its name. This is about the maximum age to which these defective embryos develop.

ple autosomal recessive character. When the early embryonic mortality exceeded the 10 per cent level (combined data), then the proportion of lethal embryos among those old enough to be classified fell significantly below the expected 25 per cent. As the early embryonic mortality increased, there was a reduction in the percentage of talpids among the classifiable embryos. It appears, therefore, that the early unclassifiable embryonic mortality involved proportionately more of the lethal than it did of the non-lethal embryos.

Test for Linkage

The demonstration of linkage involving a recessive autosomal lethal gene, especially when a majority of the affected embryos die by the eighth day, depends upon the establishment of a deficiency of chicks showing the parental combination which included the lethal gene. The test, therefore, consists of an F_2 generation with respect to the lethal superimposed upon a backcross generation for the other character. Of the five known autosomal linkage groups described by Hutt and Lamoreux,* three have been examined for the possible inclusion of the *ta* gene.

1. *"Cp-R-U"* linkage group: For this test, the mating of a $\frac{r\ Ta}{r\ ta}$ male to four $\frac{R\ Ta}{r\ ta}$ females was used and any linkage of the *ta* gene with *r* would result in a deficiency of *rr* chicks. In these matings, 170 embryos, classifiable for the lethal character, were observed, of which 42 or 24.7 per cent were talpid lethals. Of 128 normal embryos for which classification of comb type was possible, 65 were *R* and 63 were *r*. Thirteen (13) of the talpids were developed enough to be classified for comb type. There was an excess of the *R* type (9:4). It is therefore evident that if *ta* is in the *"Cp R U"* linkage group, it is not closely linked with *r*.

2. *"D M"* linkage group: A mating of four $\frac{D\ Ta}{d\ ta}$ females to a $\frac{d\ Ta}{d\ ta}$ male did

*HUTT, F. B., and W. F. LAMOREUX. *Jour. Heredity* 31:231-235. 1940.

not produce a deficiency of chicks not having duplex combs as would have been expected had *d* been linked with *ta*. There were 19 *D* to 22 *d* type progeny. In a reciprocal mating involving one male and two females, the ratio was 14 *D* to 15 *d*. These data show that *ta* probably does not belong in the *"D M"* linkage group.

3. *"F I Cr"* linkage group: Of the genes in this group, *I* seems to be the best one to use as a tester for linkage with *ta* because late dead embryos and newly hatched chicks can easily be classified for *I* or *i*. Since the lethal gene was first observed in pure White Leghorns, it has taken some time to obtain suitable *"ii"* tester stock. Among 176 chicks classified for down color from matings of *Ii* by *ii*, all heterozygous for the lethal gene, there has been a ratio of parental† to non-parental colors of 83 to 93, as compared to the expected ratio of 88 to 88 if *I* and *ta* were not linked. Although there is a slight deficiency of chicks bearing the parental color, the difference is not significant.

Summary

The talpid lethal is a simple autosomal recessive character which exerts its lethal effect usually by the eighth to tenth day of incubation. The lethal embryos are characterized by a variety of anatomical abnormalities, of which the duplication of the digits, shortening of the spinal column and the proximal bones of the appendages, and severe ectopia are the more prominent. The lethal gene is known to have been present in the departmental flock for at least eight years previous to its recognition.

The gene *ta* for the lethal character probably does not belong in the *"Cp R U"*, *"D M"*, nor *"F I Cr"* linkage groups.

†Parental color is used here to designate that color (*I* or *i*) which entered the cross in the gamete as *ta*.

Conservation of Scholarly Journals

THE American Library Association created this last year the Committee on Aid to Libraries in War Areas, headed by John R. Russell, the Librarian of the University of Rochester. The Committee is faced with numerous serious problem and hopes that American scholars and scientists will be of considerable aid in the solution of one of these problems.

One of the most difficult tasks in library reconstruction after the first World War was that of completing foreign institutional sets of American scholarly, scientific, and technical periodicals. The attempt to avoid a duplication of that situation is now the concern of the Committee.

Many sets of journals will be broken by the financial inability of the institutions to renew subscriptions. As far as possible they will be completed from a stock of periodicals being purchased by the Committee. Many more will have been broken through mail difficulties and loss of shipments, while still other sets will have disappeared in the destruction of libraries. The size of the eventual demand is impossible to estimate, but requests received by the Committee already give evidence that it will be enormous.

With an imminent paper shortage attempts are being made to collect old periodicals for pulp. Fearing this possible reduction in the already limited supply of scholarly and scientific journals, the Committee hopes to enlist the cooperation of subscribers to this journal in preventing the sacrifice of this type of material to the pulp demand. It is scarcely necessary to mention the appreciation of foreign institutions and scholars for this activity.

Questions concerning the project or concerning the value of particular periodicals to the project should be directed to Wayne M. Hartwell, Executive Assistant to the Committee on Aid to Libraries in War Areas, Rush Rhees Library, University of Rochester, Rochester, New York.

RELATIONS OF BODY SIZE TO LITTER SIZE AND TO THE INCIDENCE OF FRATERNAL TWINS

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THE various species of mammals show many similar features of reproduction. There is an essential homology in their oestrous cycles, ovulation, course of pregnancy, and in the associated endocrinal mechanisms. Their fertility depends primarily upon the number of ova shed from the ovaries, and then upon the number of embryos developing to birth.[11,16] It is not surprising to find some significant parallels between the factors controlling twin and multiple births in human reproduction and those controlling litter size in other mammals with larger litters.

Age of Mother in Relation to Litter Size and to Frequency of Fraternal Twins

In species typically producing two or more young at a birth the litter size is relatively low just after puberty, increases steadily to a maximum at the height of sexual maturity, and then declines again in the last portions of the reproductive period.[11] Thus the most fertile stage in female rats is reached at five or six months of age;[5] in pigs the fourth, fifth or sixth litter contains the most young;[11] in the house mouse the second or third litter averages the largest.[20] The number of corpora lutea found in the ovaries of female mice during the period of rising fertility proved, on further analysis, to be more strongly and directly correlated with the body weight of the mother at conception, than with either the parity or her age.[19]

In species usually producing one, but occasionally two or more young, the incidence of twin or multiple births is likewise highest at a corresponding age. In Shropshire sheep Roberts[23] found the percentage of twin or multiple births is lowest (23 per cent) in yearling mothers, and highest (46 per cent) in six-year-old mothers. "In Merino ewes the per cent of twins rises from 4 per cent at three years old to 9 per cent at five years, remains at about 10 per cent level until the tenth year, and thereafter falls off rapidly to practically zero at the twelfth year[11] (Kelly's[14] Australian observations as described by Hammond[11]).

Quite similar is the distribution of human fraternal twin and multiple births according to the age of the mother. While the frequency of uniovular twin births (0.3 to 0.4 per cent of all births) varies little with age,[2] the frequency of dizygotic twin births — and of multiple births — is at first low (about 0.25 per cent of births) in mothers under twenty, rises five or six times to a maximum of 1.44 per cent at around 37 or 38 years, and then decreases again sharply in still older mothers.[2,13,8] While the peak of human births in general is at 23-27 years, the peak of twin and multiple births occurs 12 to 15 years later.[2,13,8] This age relation helps explain the reputed high incidence of twins in large families; it would be expected, not because many births offer many chances for twin births, but because a comparatively high proportion of the births in a large family are quite sure to occur when the mother's age is somewhat advanced and particularly favorable for fraternal twin production. Birth limitation probably acts in the opposite direction; by lowering the proportion of births at later ages, it would leave the incidence of monozygotic twins unaffected, but reduce the frequency of fraternal twins.[18]

Relation of Body Size and Litter Size in an Animal Selection Experiment

From a complexly segregating population of laboratory house mice were de-

veloped by seven generations of selection *for body size alone:* (1) by plus selection, a *large strain,* in which females average 27 grams at 60 days, the age when the growth curve flattens out, and (2) by minus selection, a *small strain* with females averaging less than 14 grams at the same age. *The increase or decrease in body size brought with it* — quite unexpectedly — *a corresponding and more or less proportionate change, generation by generation, in litter size.* Wholly without any concurrent selection whatsoever for litter size the large strain bears an average of approximately 9-10 young, and the small strain only five or six young per litter. The two strains no longer overlap in their body weights, but they still overlap extensively in their much more variable litter sizes.

It was then learned that a similar relation between body and litter sizes had been reported among breeds of rabbits.[6,10] The small Polish race with females weighing 1508 grams had litters averaging 3.2 young, while New Zealand Reds (females, 3913 grams) bore 8.1 young, and the large Flemish breed where females weigh 5589 grams, had 10.2 young per litter.[6] In pigs litters are largest (11 or 12) in Yorkshire and Tamworth breeds, smaller (about eight) in the smaller breeds, and contain only about four young in the wild pig. Breeds of dogs illustrate well the same tendency. "Mutton breeds of sheep twin more frequently than the fine-wooled breeds."[1] Though twin frequency seems unexpectedly low in beef cattle, among the dairy breeds twin frequency decreased in general with lessening body size from Holsteins to Guernseys, Ayrshires and Jerseys.[17] Hammond[11] makes the generalization that it is apparently usual for larger breeds of a species to produce large litters and smaller breeds smaller litters. Fertility, generally higher in domesticated races than in their wild ancestors, has been increased mainly by extending the breeding season (increasing the *number* of litters), but also by raising the average size of each litter either indirectly by improving body size, or in some cases doubtless, directly, by special selection for fertility as such.

The observed association between body size and number of progeny holds equally for wild mammals (and birds) in nature, and reveals some unsuspected interrelations between several of the so-called "climate rules."[21] In a wide ranging species of mammal or bird, the geographic races living in the colder parts of its range (e.g. in Northern latitudes or on mountain heights) tend in general to be larger in body measurements than the races of the same species inhabiting warmer regions (Bergman's Rule). It is now possible to relate this rule with two others, which were formulated[21] quite independently of it: (1) In European and North American faunal surveys the more Northern or alpine races of a mammalian species tend to have larger litters (the "litter rule"); and (2) similarly, the Northern races of birds tend to lay more eggs in a clutch (the "egg number rule"). The two latter rules become in a sense mere corollaries of Bergman's Rule, since, on the view presented, body size and litter or clutch size are intimately correlated. Other aspects of the climate rules will be treated elsewhere.

Relation of Human Body Size to the Frequency of Fraternal Twins

Now it would be a highly interesting fact, if, as seems not unlikely, fraternal twinning was also closely related to body size among the races and racial elements comprising human populations. Such a view is proposed for serious consideration, and is indeed supported at the outset by an impressive mass of general evidence.

The practically unanimous verdict of the numerous writers* who have compiled and analyzed the extensive birth statistics among European peoples, either in Europe or where settled abroad, is that the incidence of twins and multiple births is highest among Nordic peoples and racial elements, lower among Alpine stocks, and lowest in Mediterranean areas and peoples.[2,7,9] Thus twin fre-

*Veit, 1855; Guzzoni, 1889; Dahlberg,[2] 1926; Greulich,[7] 1930; Das,[3] 1934; Hamlett,[9] 1935.

quency is greatest in Northern Europe (the Scandinavian countries, Finland, the Baltic portions of Germany, and in Celtic Scotland and Ireland[3]) and wherever Norse or Teutonic settlements were made along the coasts of France and in Northern Italy[2,3]; and twins occur more often in the United States than in South America.[9] In the United States[9] the two centers of most twinning among whites are: (1) in Kentucky (notable for the stature of its old stock) and the Appalachian Highlands, and (2) along the Northern tier of States from Minnesota (site of numerous Scandinavian settlements) to Montana.

According to the many calculations made or cited by Dahlberg[2] (pp. 61-62) a very general and significant positive correlation exists in Europe and within various European countries between light (blue or gray) eye colors and the occurrence of twins (especially *fraternal* twins). This undoubted fact has often been curiously misinterpreted. It certainly does not mean that therefore eye color genes are necessarily linked with twinning genes. It probably means rather that the Norse peoples who developed in geographic isolation North of the Baltic happened to produce and concentrate genes controlling light eyes, fair hair, tall stature, etc., and that these characters tend to remain associated even for centuries, owing to the prevalence of assortative mating, wherever large Nordic settlements were made. The maps in Ripley's valuable "Races of Europe"[22] show that tall stature is as characteristic as is light iris color of Nordic countries and colonies. Both stature and eye-color gradients tend to run parallel to the twin frequency gradient.[25] Dahlberg even mentions[2] that Tschuriloff (in a paper[24] we have not been able to obtain) found a real parallel between stature and twin frequency. Correlation between hair color and twinning could probably also be shown in Europe.

Outside Europe and European settlements the eye color correlation with twinning, of course fails. Among the black-eyed races the negroes (e.g. in the United States) have an exceptionally high twinning rate (1 twin birth in every 69 births, as compared with 1 in 87 for whites[9]), while the Japanese have the lowest known twin frequency (1 in 301 births[15,3]).

The association between body size and twinning apparently continues to hold in the black and yellow races as well as in the white race. The fact might be stressed that the lowest well established twinning rate is found in the exceptionally small-statured Japanese, among whom fraternal twins occur only a fourth or a third as frequently as among whites.[15] It may also be significant that the highest well established rate occurs in American negroes; slavers stocked their ships from West African tribes with individuals suitable for slave labor and possibly above the average in physical size and strength; at any rate we have come to expect their descendants to contribute more than their quota to heavyweight contenders in the United States.

Crucial (i.e. comparable and statistically adequate) data for a more thorough check on the relation between body size and twin frequency in diverse ethnic groups are now unfortunately lacking.[3] When they become available the obviously desirable comparisons may be made of twinning rates among large- and small-bodied groups in the black race (e.g. Kaffir and Senegalese vs. Bushman and the various negrito tribes) and in the Mongolian races (e.g. Manchu and Northern Chinese vs. Southern Chinese and Japanese; or Patagonian vs. Fuegian and other South American Indians). It may well be found that specific racial differences in twin frequency exist, apart from those associated with body size.

Meanwhile, as the matter stands, it seems that large body size is, in some important way, concerned with multiple ovulation in man, as it is in other mammals.

Endocrines Controlling Litter Size

The nature of the causal nexus between body size and litter size is not certain, but could readily be investigated. It might be, for instance, that a compara-

tively large or actively functioning anterior pituitary gland is a primary genetic racial difference, and that this in turn produces exceptional amounts of both the growth hormone (controlling growth of the long bones, etc., in young animals) and of the gonadotropic hormone (controlling multiovulations at the reproductive age). Or possibly, the links in the chain of sequence are: large body: large anterior pituitary: much gonadotropic hormone: and frequent polyovulation.[12]

Inheritance of Fraternal Twinning

Animal breeders are inclined to regard twinning, in sheep for instance, as related chiefly to the vigor and state of nutrition of the mother.[1,16] Such inheritance as is conceded is considered wholly or mainly maternal. In some studies a male influence is described.[17] In man the tendency to at least fraternal twinning is now quite generally held to be definitely transmissable *via* both the female and the male lines.[8]

The general evidence suggests that, not linked genes (p. 5), but one and the same group of genes may in large part determine body size and regulate litter size. At least in animals both these characters are evidently multifactorial, and in man both tallness and high incidence of twinning tend to be recessive.[4,8] But the general experience of animal breeders clearly warns against going to such an extreme, as to claim that there are no separate genetic factors specifically controlling litter size, or the rate of fraternal twinning.

Since the incidence of monozygotic twins is approximately equal in all races[8,15] and at all ages of mothers,[2,13] the two types of twinning, mono- and di-zygotic, appear to be largely separate and independent phenomena.[8] Such interrelation as exists between them is likely to be physiological and to be exhibited in multiple births. When two or more ova have been released from the ovary, fertilized and implanted in the same uterus, they may produce the conditions (crowding, competition, etc.) which favor the splitting of one or more of them to form extra foetuses. If this actually does take place, it would aid in explaining the peculiar sex distributions (excess of like-sexed) in sets of human triplets, quadruplets and quintuplets, among whom the monozygotic pairs and sets (always like-sexed) increase disproportionately as the number born at a birth rises from two to three, four and five.[18,13]

It still remains something of a mystery how a father can express in his immediate progeny the twinning tendency transmitted from his paternal line. If successful fertilization of all ova released requires maximal quantity and concentration of sperm.[11] the male can influence litter size or fraternal twin frequency by raising the fertilization rate; but his influence could be expressed only if extra ova had already been released by the mother and awaited fertilization. He could also balance normal against lethal genes contributed to some ova by the mother, and, by raising the survival rate, insure successful development of a larger proportion of potential embryos. It is not clear just how he might affect female fertility in the primary sense and cause extra ova to be released, or cause two oŏcytes to form ova that remain viable for fertilization and development.[13,8]

Summary

Litter size in mammals varies notably with the age of the mother, and, within a species, with body size.

Fertility is generally greatest at the height of sexual maturity; litters are then largest, and fraternal twins most frequent.

The cues afforded by a mouse selection experiment indicate that litter size is related in some important way also with body size. The rule appears to hold for mammals, as a rather broad generalization with some exceptions, that, within species limits, litter sizes average largest in the larger races of laboratory animals, in the larger breeds of domestic animals, and in the larger geographic races of wild animals in nature. Evidence is assembled supporting the parallel view that the larger races of man also

tend to show the highest incidence of fraternal twins and multiple births.

The gonadotropic hormone of the anterior pituitary provides an effective nexus between body size and litter size.

The hereditary factors regulating frequency of fraternal twins are probably in the main the same as those controlling general body size, and only in part specific for fraternal twinning as such.

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GENESIS OF THE WHITE-EYED MUTANT

THE Journal of Heredity for January, 1942, contains a review of Lutz' excellent book on "A Lot of Insects," in the course of which the reviewer, Ramsay Spillman, gives the following quasi-quotation:— "It is surely of scientific historical interest that while studying Drosophila for variations in the wing veins, Dr. Lutz found a white-eyed mutant, but having his hands full with the wing-vein problem he gave over five descendants of the white-eyed sport to Professor T. H. Morgan." This is not quite Lutz' statement, which reads:— "He took live descendants of this white-eyed sport and bred from them. Eventually he got the white eye back." It is not obvious from this statement that the flies that Lutz gave me were the descendants of the "white-eyed sport" since it was dead when found, unless the bottle had contained a virgin female and the white-eyed male. Moreover if it had mated before death to a female many white-eyed males would have appeared in the next generation, which was not the case.

Spillman's statement is similarly inconsistent, for, if Lutz had given me the offspring of the "white-eyed mutant," as reported, pair matings of those flies, if they gave any white-eyed flies at all, would have given white eyes in one-half of the males. Nothing of the sort happened. The single white-eyed male that I found, bred to a sister, gave all red-eyed offspring, and some pairs of these when inbred gave one quarter white-eyed males, etc.

Lutz told both Sturtevant and me, after the white-eyed male had been reported, and not at the time he gave me some stock, that the dead "white-eyed" fly that he noticed was, he had supposed, one from which the larvae had removed

the eye pigment, which is not a very uncommon occurrence. It may, however, have been a dead white-eyed mutant which left no offspring. In neither case can it have been ancestral to the flies given to me by Lutz or to his own subsequent cultures.

I was, of course, familiar with the important paper of Castle, Carpenter, Clark, Mast and Barrows (1906) and had used it in my lectures on Experimental Zoology. It seemed to me that *Drosophila ampelophila* might furnish excellent material for genetic work since it could be easily and cheaply bred in the laboratory. I knew that Lutz was breeding these flies and asked him to give me a culture, which he kindly did.

We know now that the white-eyed mutant is one of the commonest mutant types. It has recurred again and again, as have also its allelomorphs. Finding it was not so important as the use to which it was put. Lutz closes his story with a characteristic and generous statement, "If I had realized how valuable that white-eyed mutant was destined to be, I would not have been happy to give it away. However, it fell into good hands . . . ."

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California Institute of Technology

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"Topsying" the Maize "Ghost"

To the Editor:

So sorry if the maize geneticists have inadvertently caused perplexity to the editor of an honest-to-goodness on-the-record publication. I am the more disturbed because I like the Journal of Heredity and its editor a lot. First maize, then Drosophila and now mice and twins. And, who knows, maybe later cabbages and kings!

I can plead only that I did not invent the maize ghost "publication" — nor did anyone else. It just growed. It started with personal correspondence and exchange of material between my former students and me. Soon others, whom, I regret to say, I cannot claim as former students, came in. When the load became too heavy, Rockefeller funds came to our assistance. I believe it is an understatement to say that the group of maize geneticists has accomplished twice as much because of this close cooperation as the several workers involved could have accomplished independently.

So, if other groups find such cooperation as useful as the maize workers have, where will it all end? It's just too terribly bad.

R. A. Emerson.

The Editor stands, as usual, inky but not altogether bowed. Through the ink his face is not too red, because out of his random protestings has come this very interesting historical note.

The Editor has never for a moment intended to question the value of the "ghost method" of publication to facilitate research in special fields. He is all for it, and he can claim to have helped in various ways to bring some of these ghosts more abundant life. The whole tenor of his remarks proved, he hopes, that his feeling is one of very cordial perplexity.

The main basis for the perplexity remains something more than a quibble. He still maintains that serious complexities are introduced when the "ghost publications" began to be "published" through citation in the literature. These publications are by their very nature at least semi-confidential. No effort is made to distribute them except to actual research workers in the special field they cover. They are definitely not intended to be filed in libraries where they will be available for reference. Not over a couple of hundred copies of most of them are issued. These are used as laboratory work books and eventually disappear after their usefulness has come to an end. Thus there is no provision whatever made to make them available for reference. Thus when *DIS* is cited how are later readers going to find what the reference is to? If, as is now the case, the reference is to nothing in any library, it does seem to be a perplexingly inadequate form of publication.

The Editor even went so far as to hint how this might be corrected by filing copies of these "ghosts" with the American Documentation Institute, or at least filing such parts of the anatomy of these ghosts as became crystallized by formal citation in publications. Then the later reader could find out what was referred to. It doesn't seem to be altogether cricket to make reference to something which is admittedly unpublished and which is by definition not available to be referred to. The plan suggested seems to take care of the most serious objection which can be raised against this very valuable form of quasi off-the-record exchange of information.—R. C.

SEARCH FOR PARACOLON IN BACTERIUM COLI-MUTABLE POPULATIONS

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COLIFORM bacteria constitute a large group of Gram-negative, non-sporing, rod-shaped bacteria which are distributed widely in nature.[1] Although certain forms of this group are potentially pathogenic, coliform bacteria are chiefly significant because an important species, *Escherichia coli,* has come to be regarded as the intestinal microbe *par excellence* which may be used as an indicator for the presence of fecal material in places where it should not be. As a result sanitary examination of such materials as water, milk, crab-meat, oysters, grains and soil are much concerned with the colon bacillus.

One of the reactions which this group gives is the rapid fermentation of lactose with the production of acid and gas. This test is utilized in bacteriological analyses of materials in which intestinal bacteria are apt to be found. Unfortunately we now know that the ability of coliform bacteria to ferment lactose is far from typical for all strains, or varieties. There exist bacteria which good evidence leads us to believe are coliform which do not ferment lactose at all. Such organisms are called "Paracolon" bacteria, and they are of some limited importance because they have been reported from diseased conditions and because they may be confused with the *Salmonella,* or paratyphoid group of pathogenic bacteria.

Between these lactose negative paracolon bacilli and the typical coliform organisms, numbering four species (*Escherichia coli* and *freundii,* and *Aerobacter aerogenes* and *cloacae*), there is a group of atypical or aberrant forms which ferment lactose slowly, incompletely or only at certain incubation temperatures. The common and troublesome occurrence of these slow or atypical lactose fermenting coliform bacteria is well known to bacteriologists and has been an object of interest and study since Neisser and Massini first described one such form as *Bacterium coli-mutabile.* This organism does not ferment lactose promptly when seeded into a lactose broth medium. It does bring about dissimilation of the carbohydrate after a lapse of days or even weeks.

When plated on a lactose-indicator agar medium, *Bacterium coli-mutable* produces colorless colonies which at first show absolutely no evidence of lactose fermentation. After some days, however, *papillae,* or secondary colonies, grow out of the original primary colonies (see Figure 4). These secondary colonies take on a color (depending on the indicator used) connoting lactose fermentation. A subculture into lactose broth from such a secondary colony gives prompt and typical lactose fermentation and this characteristic is faithfully reproduced in subsequent culture. On the other hand, a "fishing" from an original primary colony, before secondary colonies appear, or from portions of such a primary colony later on, avoiding contact with any secondary colony growth thereon, results in growth in lactose broth with delayed fermentation. *Bacterium coli-mutabile,* therefore, by simple manipulation, yields (1) a prompt and typical lactose fermenter, which some consider as a "mutant" and (2) a slow-lactose-fermenting strain which continues to breed true, but from which the prompt fermenter can be obtained at will.

If such a phenomenon has any relationship to genetic activities in higher forms of life it may well be asked whether such atypical coliforms ever yield true lactose negative or paracolon bacteria. In work with the coliform citrate "mutant"[2] Parr and Simpson[3] noted that among the progeny of a citrate positive there might be found individual

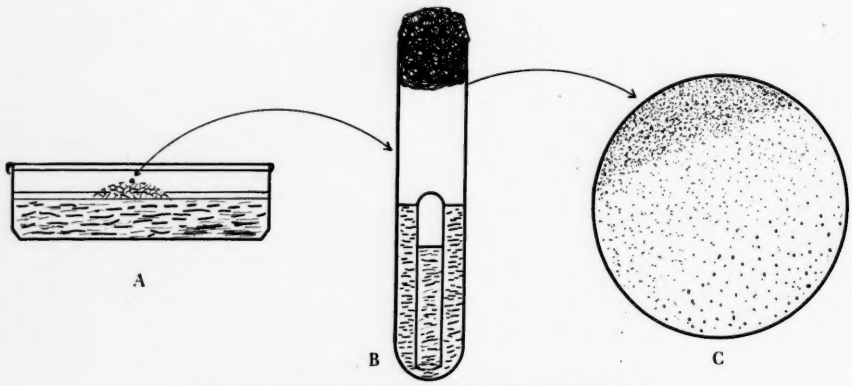


DIAGRAM TO ILLUSTRATE EXPERIMENT I

Figure 3

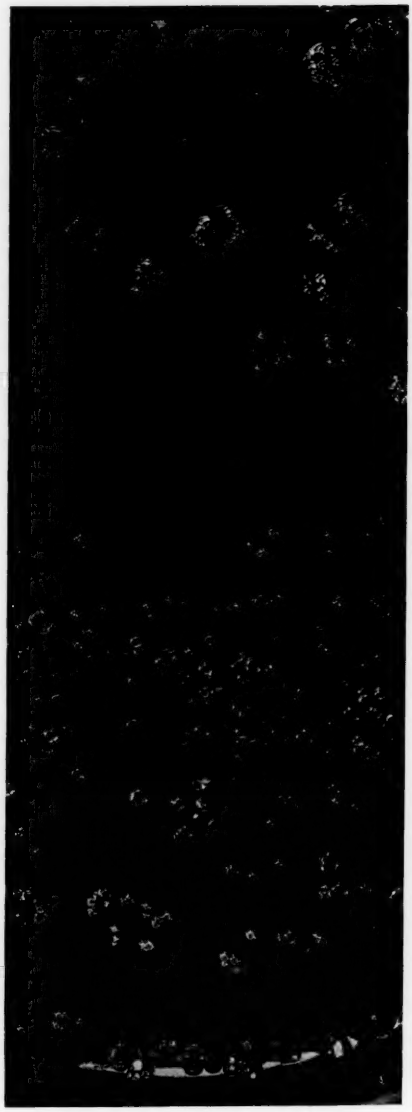
A—Side view—Secondary colony on colony of *Bacterium coli-mutabile; B*—Lactose broth tube, showing fermentation; *C*—top view, open plain agar plate, numerous colonies. From plain agar plate 10-40 colonies picked to lactose broth. From one such tube another agar plate is streaked. Again colonies picked to lactose broth and so on. In this way 12.113 colonies from 468 agar plates from 59 different *Bacterium coli-mutabile* strains were studied.

cells which had failed to acquire the character of utilization of citrate as a sole carbon source. Selection of such citrate negative cells gave rise to true breeding, citrate negative lines which were otherwise culturally and serologically identical with the citrate positive strains. Such findings are quite in harmony with the theory of "bacterial variation" suggested a few years ago by Reed.[4]

The occurrence of these "throw-backs" or "blanks" in the citrate "mutant" suggested the possibility that a similar situation might occur in *B. coli-mutabile*—that in addition to the "eversporting" form, we might find a non-sporting mutation, which would consistently fail to ferment lactose. Thus we envisioned the possibility of "plus" and "minus" "mutations" arising in our constitutionally unstable *coli-mutable*, the "minus" mutations being, to all intents and purposes, paracolon bacilli. Should such "artificial" paracolon bacilli be found, it would throw a new light on "genetic" continuity in bacteria. It would be very important experimental evidence in support of Reed's theory, which is still a subject of controversy.

Search has accordingly been made for such stable non-lactose-fermenting paracolon bacteria in the cell populations present in newly established typical lactose fermenting lines derived from *mutabile*. By the first method utilized 59 strains of slow lactose fermenting coliform bacteria (*Bacterium coli-mutabile*) from a variety of sources were studied (see Figure 3). From each of the 59 its prompt fermenting "mutant" was derived. It was desirable to avoid any influence of lactose and also to ensure random selection and hence the newly derived "mutant" was plated on plain agar. From such a plate a number of colonies were picked to lactose broth. From one such lactose tube another plain agar plate was made and more colonies fished to lactose broth and so on serially. In all, 468 plates were made from the 59 strains and from these plates, 12,113 colonies were fished to lactose broth tubes. In no case did we fail to obtain lactose fermentation.

The second method involved multiple "fishings" of secondary colonies. Such secondary colonies have been reported as appearing on culture mediums in which no question of delayed fermentation was concerned, in fact, on mediums containing no fermentable substances. In such cases their exact significance is not known but it has been suggested as one



BACTERIUM COLI-MUTABILE

Figure 4

Growth of *Bacterium coli-mutabile* on a plate of lactose-indicator agar. All colonies the first 24-48 hours are colorless (dark in the photograph), and no irregularities can be seen. Shortly, where colonies are many, colored (light) points arise on and among the crowded colonies. Shortly, too, on isolated colonies secondary colonies appear, colored, indicating lactose fermentation. Propagation from colored "points" or "secondaries" gives promptly fermenting line; from colorless colonies or parts thereof gives delayed fermentation with a production, on plating, of "mutating" colonies.

explanation that they may represent cannibalistic activity,—the desperate effort of an ageing, dying aggregation of cells (colony) to survive. At any rate it was thought that the search for lactose negative coliform bacteria in *Bacterium coli-mutabile* populations would not be complete unless a number of secondary colonies from different strains were examined. Accordingly 70 Endo's lactose indicator agar plates were utilized for this experiment. On these plates the growth was from five to 27 days old. The cultures streaked on the 70 plates were chosen at random from the 59 *Bacterium coli-mutabile* strains of the first test. Seven hundred and ninety-nine well isolated secondary colonies were "fished" to lactose broth. Every "planting" resulted in the prompt and typical fermentation of lactose.

Again, reference to the photograph of a plating on Endo's agar of a strain of *Bacterium coli-mutabile* reveals that not every well isolated colony develops secondary colonies. The question naturally arises, whether such colonies might contain true lactose-negative coliform bacteria in whole or in part. The third method of approach to the problem then was to "pick" such colonies to lactose broth and observe the tubes for lactose fermentation. Thirty-nine such colonies from some fifteen different plates were "fished" to lactose broth. In no instance was a consistent non-fermenter obtained. What was observed was that the colonies examined gave rise to atypical fermentation. This fermentation differed from that of a young (24 hour old) *Bacterium coli-mutabile* colony on Endo's agar in that acid or acid and a trace of gas was relatively promptly produced but typical acid and gas production was not observed. We have as yet no explanation for the behavior of such colonies, save the hypothesis that they probably contain too low a concentration of prompt lactose fermenting "mutants" to give rise to secondary colony formation. The colony population must, however, contain some lactose fermenters because the growth they produce in lactose broth results in prompt, if atypical, lactose fermentation.

Our data then revealed no true lactose non-fermenting coliform bacteria (paracolon) in the populations of *Bacterium coli-mutabile*, by any of three experimental approaches utilized.

If lactose negative coliform bacteria do arise from such an ancestry these experiments demonstrate either that the "mutation rate" is low or that some set of conditions is necessary for their derivation which our experiments did not provide. Methods which we found successful in our citrate work for obtaining citrate negative strains from a citrate "mutant" have not given us lactose negative coliform strains from a *Bacterium coli-mutabile* source.

Both the citrate "mutant" and *Bacterium coli-mutabile* lend themselves well to studies of this sort. It is hoped that more biologists may turn to these, and other bacteria, in their genetic research; for there is great need for such studies as suggested by Burrows,[5] when he says: "It cannot, then, be emphasized too strongly, that, so far as known, bacteria do not differ in any essential way from other living cells and any interpretation of variation or other phenomena must rest on a sound biological foundation." It is too tacitly assumed that because chromosomes are not demonstrable in bacterial cells and because bacteria are probably completely asexual they have no place in the field of genetics. Some mechanism exists whereby typhoid bacilli and not pneumococci arise from typhoid bacilli. A very definite mechanism appears to be demonstrated by these experiments whereby *B. coli-mutabile* "mutates" consistently and frequently in one direction and not at all, or very rarely in another. What it is we should like to know and if we knew it might help us to understand why certain things happen among the higher forms of life.

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Reproduction and Altruism

Among the mammals, the care of offspring has become part and parcel of the perpetuation of life. In fact, the possession of mammary glands, the unique structural feature to which the class of Mammalia owes its name, would be valueless in the absence of the maternal instinct to foster and nourish the young, and the correlated instinct of the young to obtain its food from the maternal fount. As in birds, parental care increases, as a rule, as we pass from lower to higher forms. In the apes it is exhibited in many ways that appear quite human. We may regard it as the source of social sympathy and affection. It is the earliest form of true altruism. Without it man would probably never have become a "normal animal," as he was said to be by Herbert Spencer.

Parental care, as I have attempted to show (although lack of space forbids producing sufficient evidence for this conclusion), is an outgrowth of accessory reproductive activities which have been superadded to the more primary reproductive functions. If it has afforded the evolutionary basis for altruistic behavior it is because reproduction is fundamentally and essentially an altruistic function. It is concerned not with the individual *per se* but with others. We can not say that altruism evolved out of egotism. Both are present in the simplest organism that divides by fission. Both are coeval with life itself.—Holmes, S. J., "How Life Becomes Complex." *Sci. Mo.*, Jan., 1942.

METAXENIA IN AN OAK SPECIES CROSS

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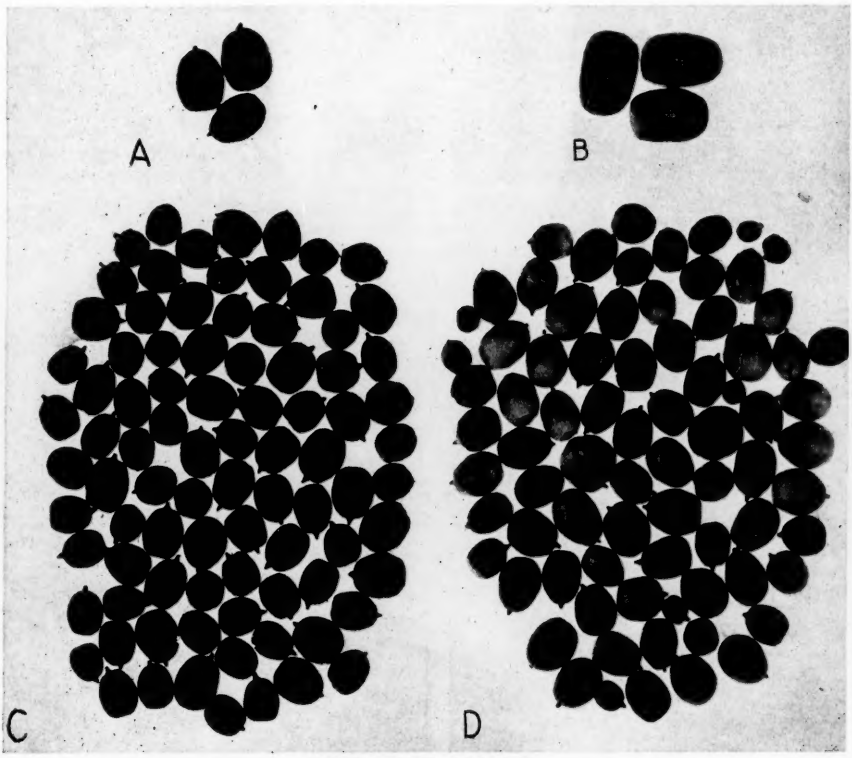

EFFECT OF POLLEN

Figure 5

In a cross of two species of oaks a remarkable metaxenial effect was observed. The female parent, *Quercus alba* (*A*) had brown fully matured acorns on September 23, 1941, in contrast to the male parent, *Q. robur* (*B*), in which species the acorns were still green. The acorn of an interspecific hybrid between *Q. alba* ♀ × *Q. robur* ♂ on the same date are shown at *D* in contrast to a group of normal *Q. alba* acorns shown at *C*.

AN apparent case of metaxenia similar to that reported by Swingle[2] and others for dates has been observed in an interspecific cross between *Q. alba* (♀) and *Q. robur* (♂) made in the spring of 1941. The parent trees are growing at the same elevation about one-quarter of a mile apart at New Haven, Connecticut. The effect of the pollen parent in delaying maturity of the hybrid acorns is apparent from the photographs (Figure 5). On Sept. 23, 1941, all acorns matured to controlled intraspecific pollinations and most of the open-pollinated acorns on the ♀ parent (*Q. alba*) were brown, fully matured (*A* and *C*), and dropping from the cups; those of the ♂ parent (*Q. robur*) were light green (*B*) and still tightly attached. The acorns matured to the controlled interspecific cross with *Q. robur* varied from brown to light green (*D*); the green, immature acorns were still tightly attached to the cups.

*Maintained by the U. S. Department of Agriculture, Forest Service, at New Haven, Conn., in cooperation with Yale University.

Since we have not yet successfully crossed *Q. robur* (♀) × *Q. alba* (♂), it is not known whether this reciprocal cross results in earlier maturity of the fruit.

It was further observed that the *Q. alba* × *Q. robur* acorns were somewhat larger than those matured to controlled intraspecific pollination. Since the term "metaxenia" is restricted to "any phenomenon that may be caused by the action of the zygote upon the surrounding maternal tissue" (Nebel[1]), this size difference in acorns can hardly be called metaxenial. The possible effect of the pollen parent on acorn size is noted here because of its practical importance to tree-crop and hillculture research aimed at the production of large acorns for stock or wildlife food.

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A PEDIGREE OF OTOSCLEROSIS

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THIS pedigree is from a study of that type of hereditary deafness known as otosclerosis. A graphical sketch showing the pedigree is given in Figure 6.

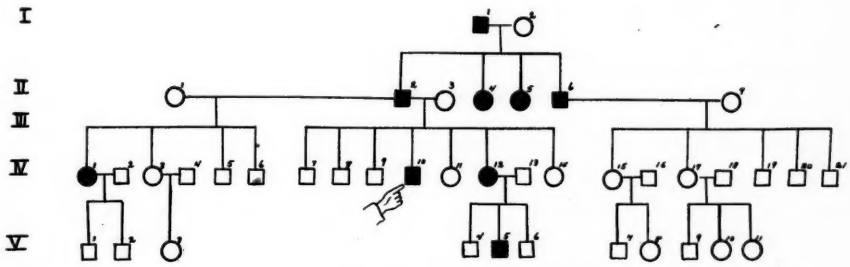
Otosclerosis in this pedigree is obviously dependent upon an autosomal dominant gene. This is evidenced by II-2. He was deaf, married twice, and produced some affected children by both marriages. Two other otosclerotic parents produced some offspring similarly affected. One peculiarity is noted in this pedigree. The ratio of deaf to normal children from marriages of one affected and one normal parent is expected to be one to one. In this pedigree eight deaf and fifteen normal offspring were produced from such marriages. This fact suggests an irregularity in the expression of the otosclerotic gene. There may be some normal persons who nevertheless carry the gene causing otosclerosis.

A recessive type of otosclerosis has been described by Tinkle[2] and by Gradenigo (quoted by Tinkle[2]). Bauer, Fischer, and Lenz[1] mention several cases of dominant otosclerosis.

To verify the fact that the deafness of the present study is of that type clinically classified as otosclerosis, the diagnoses of three physicians were collected: Dr. John Shea of the Shea Clinic and Dr. P. M. Lewis, both of Memphis, Tennessee, and Dr. J. Eschenbrenner of the Coffee Clinic, Fort Worth, Texas. The individuals so diagnosed are III-10, III-12, and IV-5.

Otosclerosis is caused by the deposition of a soft, spongy bone in the middle and inner ear. This replaces the normal bony labyrinth. If this process continues to a very great extent, the base of the stapes becomes anchored firmly, and the surrounding space fills up with bone. Otosclerosis is thus a type of deafness which becomes progressively worse over a considerable period. Low tones become hard to hear and may become completely inaudible, whereas the perception of higher tones seldom is inhibited to a marked extent.

According to W. J. Tinkle,[2] otosclerosis usually begins in middle age and rarely before puberty. In the pedigree of the present study, affected members noticed that their hearing was impaired in their late teens and early twenties. Although otosclerosis is gradual, it rarely brings about complete deafness. Yet the hearing of II-2 began to degenerate in his late teens and continued to the extent that in his relative old age he



A PEDIGREE OF OTOSCLEROSIS

Figure 6

Here in four generations otosclarosis, a form of deafness due to abnormal bone growth, has been inherited, apparently as a dominant characteristic.

became completely deaf and found it necessary to carry a writing pad so that others might communicate with him. Other affected members of this pedigree became only partially deaf. For example, IV-5 first noticed a defect in his hearing at seventeen years of age. For a period of three or four years the deafness progressed very rapidly, but now it has become arrested. The young man is in his early twenties and graduated from college in June, 1941. As is evidenced by these two individuals, otosclerosis in this pedigree is variable in its degree of expression.

Usually the nasal passages and eustachian tubes are normal in persons suffering from otosclerosis. However, in this pedigree otosclerosis appears to be aggravated by the presence of catarrh, which affects the nasal passages and eustachian tubes. For example, II-2, III-10, the propositus of the pedigree, III-12, and IV-5 were troubled with catarrh as well as being deaf. It was impossible to obtain any information about catarrh in the other members of generation II. III-3, with normal hearing, also had catarrh. Dr. W. S. Webb of Fort Worth, Texas, found that in the case of III-10 the surface of the nasal bones was roughened, causing an excess of mucous to be produced as the breath passed over them. This mucous caused a scar-like tissue to be formed in the nasal passages and inner ear, thus interfering with hearing, according to Dr. Webb. In 1931 Dr. Webb removed in part some of these bones, effectually reducing the amount of mucous produced. The hearing of III-10 has become no worse since that time. Two years later, in 1933, Dr. John Shea diagnosed this same individual, III-10, and pronounced the deafness otosclerosis. Dr. J. Eschenbrenner who is now treating III-10 also diagnosed his deafness as otosclerosis.

The author is indebted to Dr. John Shea, Dr. P. M. Lewis, Dr. W. S. Webb and Dr. J. Eschenbrenner for permission to refer to their diagnoses.

Summary

A pedigree is presented of the type of deafness known as otosclerosis. In this pedigree otosclerosis is dependent upon an autosomal dominant gene. The degree of deafness varied from partial deafness in most affected individuals to one case of severe deafness. Three deaf members and one hearing member of the pedigree suffered from catarrh, although catarrh is not usually associated with otosclerosis.

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GETTING READY TO BE A FAMILY

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YOUNG people today are trying to prepare themselves for marriage and parenthood. Getting ready to be a family is a serious business. Some are seeking services of marriage consultation centers. Others have conferences with physicians, clergymen or educators. Many members of these professions are ready to help but few are able to go beyond their own specialized field. For example, physicians are not always ready to go into psychological and social adjustments, even when these have a bearing on health and plans for parenthood. Clergymen cannot always enter into discussion of physical problems even when these have a direct relation to the psychological and spiritual adjustments. Recently enacted state laws enforcing premarital examinations for venereal disease are focusing public attention on blood tests but comparatively few men and women realize the need for more extensive premarital examinations in order to determine fitness for parenthood.

Men and women who have used the Premarital Consulation Service of the Maternal Health Association in Cleveland ask the following questions: When is the best time for us to have children? Can we be reasonably sure that our children will be healthy and normal? Where can we get good obstetrical care at a reasonable cost? How much time should there be between pregnancies? What traits can be passed on to our children? They discuss the possible size of their family and the tendency now is to want four rather than two children. Today these young people approach marriage with less concern for financial security and with more reliance on their own ability to meet emergencies and make adjustments.

An analysis of the 234 couples who used this Cleveland service last year showed that the majority came through friends and relatives, although several heard of the service through clergymen, doctors and social workers.

The educational background of both men and women was interesting. Seven had not gone beyond the eighth grade and 40 had not finished high school; 148 had completed high school and 55 had more than a high school education. The educational background of twenty-nine was unreported.

The ages of the women show that 17 were under nineteen years of age; 198 were between the ages of twenty and thirty; 17 were between thirty and forty; and two were over forty.

The study shows that 16 of these potential families were looking forward to a weekly income of less than $20; 30 expected to have from $20 to $30; 49 planned on from $30 to $40; 53 on from $40 to $50; while 76 expected to have $50 or more. Information was not secured from three families. In 92 instances the woman expected to help earn the family income. In four instances relatives were helping, and in two of the contemplated marriages both were students expecting to live on scholarships.

A large number of the men and women who have used this service have come of their own volition and frequently say, "I just want to talk my plans over with someone who does not know me, because we want our marriage to be a success. What will make our marriage successful?"

In the group who consult with the staff physicians there are those with serious health handicaps, epilepsy, tuberculosis, various cardiac conditions, while others are immature and need to learn to face their own issues. All are trying to start their family with certain strengths that will be a foundation upon which to build. War affects individual and family life. We think of its disintegrating effects, but it may also isolate and strengthen family relationships and responsibilities.

HELPING YOUNG AMERICA TO RESPONSIBLE PARENTHOOD

Through Changing Psychological Attitudes*

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ATTITUDES are difficult to analyze, define, and reduce to statistical terms. Even comparatively simple attitudes described as "friendly" or "hostile," "constructive" or "destructive" are complex and protean. But when we try to interpret and evaluate the shifting, often contradictory attitudes or feelings which urge young America toward parenthood, or away from it, the task is disturbingly difficult.

We know, for example, that many economically and educationally privileged young Americans look upon parenthood as something to be avoided as long as possible, or even permanently. Many parents, business executives, and professional advisors specifically warn gifted and highly intelligent young men and women against marriage, particularly early marriage. "Don't get tied down early," "Don't take on responsibilities that will interfere with freedom and advancement," "Don't marry until you can marry money," "Don't waste your education on marriage" are among familiar and typical warnings heard in homes, in business, in professional schools and graduate colleges.

To be realistic is to admit that such advice is sound in our competitive society where success is often won only at great personal and emotional cost. From a eugenic point of view, however, the failure to marry, or the failure to have a sufficient number of children on the part of the educationally privileged group under discussion represents a serious and dangerous national loss. To prevent this loss, much more will be required than "the development of effective economic and social aids to encourage responsible parenthood" important and helpful as such aids may prove to be in individual cases. Even the most democratically devised and administered system of aids will not be "effective" unless and until certain current and widespread psychological attitudes toward the family, marriage, and the self are changed. In other words, the responsibilities of parenthood can not be undertaken willingly, enjoyed, and adequately met by a generation of young people brought up to consider economic success and physical comfort of primary importance. To be specific, having children in most homes means going without the latest and best developments in the way of goods and services, those very goods and services which in our society have come to symbolize personal success and social superiority. Again from the point of view of eugenics, far too many mentally and physically superior young couples are postponing the arrival of the first and only child until a house is bought, a continuous series of new cars is possible, and money to pay someone else to care for the child is in the budget.

Changing feelings and attitudes is a slow process and never automatic. Changing feelings and attitudes which are deeply rooted in earliest family experiences and continuously reinforced by advertising, moving pictures, and other forms of fiction — as well as the apparent values of the economically successful, pattern-making group in our society — will require critical reexamination of many of our accepted ways of life. Whether or not it will prove to be necessary to change in any fundamental sense what we are pleased to call the American Way will depend upon our intelligence, our capacity for objectivity, and the sincerity of our faith in the democratic ideal. Whether or not the present world-wide threat to the very existence of democracy will help us to take re-

*Presented at the Annual Meeting of the American Eugenics Society, May, 1941.

sponsible and intelligent action in time to change attitudes and values still remains to be seen, and will depend in large part upon such groups as the eugenics group. Before relevant changes can be made, however, constructive and destructive attitudes which affect family life positively or negatively must be recognized. The basic social experiences which helped create such attitudes must be examined and evaluated if we are to conserve our best human resources.

The following analysis of "constructive" and "destructive" psychological attitudes which seem to be helping or hindering young America in achieving responsible parenthood is not a report of any one specific study or research inquiry. It is rather the result of an attempt to summarize the qualitative implications of objective data obtained during a long-term, cooperative study* of the family adjustments and personal problems of one hundred college women, fifty of whom were employed outside the home. Attitudes toward marriage and family life revealed by several generations of college students during their work in courses concerned with the family, human development, and the total process of personality achievement in our culture have also been incorporated. Perhaps most important of all in making such an analysis are insights which develop from what a consulting psychologist is privileged to learn about the texture of human relationships and the possibilities for change and growth. This particular analysis of "constructive" and "destructive" psychological attitudes is, therefore, frankly subjective, presented tentatively, and in no sense is considered to be an objective report or analysis of the attitudes of any particular group of research subjects.

Constructive Psychological Attitudes Which Help in the Achievement of Responsible Parenthood

Self-forgetfulness: the capacity to identify with others, to work for others, to feel a needed and integral part of a group.

Self-control: the capacity to work long and patiently for a future goal, to enjoy the process as well as the eventual achievement.

Self-friendliness: the capacity to respect the self, to accept one's own inevitable limitations realistically, the ability to keep on changing, learning, and growing.

Destructive Attitudes Which Hinder the Achievement of Responsible Parenthood

Self-centeredness: the feeling that one's own comforts, pleasures, or satisfactions are of major importance.

Self-defensiveness: the feeling that other people are essentially unfriendly or hostile, that one must be on guard against attack, or must attack first.

Self-distrust: a basic feeling of unworthiness and inadequacy, an unwillingness to accept inevitable personal limitations, a lack of the ability to keep on changing, learning, and growing.

Formulating both "constructive" and "destructive" attitudes which help or hinder the achievement of responsible parenthood in terms of the "self" may seem so out of place to some of you as you read, as to require explanation. It is not within the scope of this paper to discuss psychological theories, but it is relevant to list the basic assumptions about the process of personality development which lie behind what is being said, assumptions which must be considered if the goal of "responsible parenthood" set by the American Eugenics Society is ever to be achieved.

Basic Assumptions About the Process of Personality Development

Including the Development of Constructive or Destructive Psychological Attitudes

1. The basic personality pattern or structure of each individual is largely the result of what adults do to him or expect from him in childhood in the process of inducting him into the culture.

2. Basic attitudes about other people and the self begin to develop out of person-to-person experiences in the family long before language is learned, are

*See Erich Fromm, *Escape From Freedom*; Karen Horney, *Neurotic Personality of Our Time*; James Plant, *Personality and the Cultural Pattern*.

deeply rooted, and most resistant to change.

3. What adults do, or fail to do, to the individual in his earliest and most formative period, constitute his basic experiences: these experiences give rise to, or result in, certain psychological attitudes toward himself and others which become characteristic of the growing personality.

4. It is not possible to understand the adolescent or adult personality without knowing what an individual's earlier experiences have been, in the sense of knowing what these experiences have meant to him, and what characteristic attitudes have resulted.

5. In our particular culture with the split between emphasis on competitiveness and success on the one hand and cooperation and friendliness in the other,* all individuals grow up with the basic conflict incorporated to some extent in their own personalities.

6. This conflict produces feelings or phychological attitudes which may be constructive or destructive depending upon the extent to which the individual can achieve some kind of inner balance.

7. Failure to achieve inner balance or to resolve the conflict produces chronic anxiety which distorts family relationships, and leads to aggressive or defensive behavior.

In other words, any sensible and intelligent attack upon the whole complex problem of improving the quality of our people from both a eugenic and a democratic point of view must be based on recognition of the fact that attitudes determine action. And where do attitudes come from? As has just been suggested, attitudes develop out of experiences with people, particularly the people who are emotionally most important earliest in life. The parents and members of the family with whom the individual belongs in his earliest and most defenseless years provide — or are unable to provide — the experiences which satisfy or meet his fundamental human needs for security, protection, affection, increasing independence, and being respected as a unique and developing personality.

Studied from this developmental point of view, it becomes possible to define "responsible" parenthood in more basic terms even than good genetic endowment, and the ability to provide economic security. It is the *emotional* environment of the family which is most important from the point of view of personality development. Well-adjusted friendly parents are able to bring up children with "constructive" attitudes toward the self and others. Such children, having had their own developmental needs met or satisfied in infancy and childhood, are also able to enjoy having families and can, in turn, meet their children's basic needs. Defensive and unduly competitive parents are poorly adjusted in terms of their own personalities, no matter how brilliant and successful they may be in the professional or business world. No matter how much economic security and educational opportunity they are able to provide, parents with what have been called "destructive psychological attitudes" almost inevitably expect too much too soon from their children in the way of so-called "adult" behavior. Depriving infants and children of space to grow in and time to mature normally in their own ways is dangerously easy in our modern, mechanized, urbanized world geared to speed and efficiency.

From the point of view of personality development, no equally satisfactory equivalents have yet been worked out to take the place of an older type of American family life in which both parents were working at home, all children helped and had genuine responsibilities. In such families learning to adjust to the needs of older and younger people was a natural and inevitable part of daily life. More boys and girls grew up

*A preliminary report of this study undertaken by the staff of the Family Consultation Bureau of the Child Development Institute of Teachers College has appeared in "Marriage and Work for College Women" in the January 1939 issue of the *Vassar Alumnae Magazine*. The complete report will be published as soon as possible.

in this period knowing first-hand what children were like than is possible now in the days of small families, segregation into age groups for recreation, and the lack of responsibility for the group welfare which is inevitable in most upper-income families.

We are at last beginning to understand why parenthood must be entered into willingly, and *enjoyed* if it is to be "responsible." Enjoyment of the responsibility comes apparently only when the process of day-to-day living with children is satisfying and interesting to both parents. Defensive and chronically anxious parents, regardless of their economic status and superior physical and mental endowment, cannot be "responsible" parents in the sense of providing experiences which make it possible for a child to develop "constructive" attitudes toward himself and others.

We are beginning to understand, too, why it is that so many educated men and women find having children and helping them grow up a baffling, burdensome, and strangely disturbing experience. Knowing nothing about children, they can be neither adequate nor confident. We are also seeing more clearly why many superior and intellectual women can adjust to their basic emotional conflicts only in terms of celibacy or frigidity. Why so many superior and intellectual men must avoid marriage and parenthood for the same reasons.

Attempting to change current patterns of family and social life which have helped produce the destructive psychological attitudes just discussed will be disturbing and, to many who do not think in terms of democratic values, dangerous. But changes must be made, if the level of our national life is to be raised, and our best human resources conserved and developed. Schools and homes together must soon recognize the consequences of the artificial but serious psychological barriers which have been allowed to develop, and now exist, between generations.

One specific attack on this problem is to recognize frankly that our present methods of what amounts to practical and continuous segregation and isolation of children from nursery years on into their "own age" groups has serious limitations. The large majority of our children at present go to school, join after school clus or groups, attend summer camps, always with their "peers"—that is, with other individuals at the same general stage of emotional, social and intellectual development. What experiences they have with adults or older individuals are largely colored by authoritarianism of teacher-child, parent-child relationships. As families become smaller and older patterns of participation and mutual responsibility for general family welfare become less usual, experiences shared with infants and younger children become almost non-existant. We must find out how to bring up children who are at home with, and enjoy, younger and older people as well as their own contemporaries.

Changing current values among our privileged and educated groups is of major importance because these people are still the most articulate, the leaders, and the pattern-makers for other groups who also hope to achieve equality of opportunity and education for their children.

Perhaps the chief importance of developing effective social and economic aids suitable for a democratic society will prove to lie in a gradual change in attitude toward parenthood which such aids can help bring about among the present parent generation having children under ten. Having children and grandchildren will become more desirable because more satisfying and less burdensome.

In this way, and through education, parents can be encouraged to provide the kinds of experiences which will help their children develop "constructive" psychological attitudes more in keeping with true democratic values, as well as more useful in the achievement of responsible parenthood.

THE SWEDISH POPULATION EXPERIMENT

IT is to be hoped that American eugenists have not been exposed to so many outlines of the Swedish population program that, like schoolboy readers of the classics, they have lost their appetite for the fuller account. Such an account is now available for the first time in English in Alva Myrdal's *Nation and Family.** It is a solid piece of work, and also a fascinating and challenging one.

Nation and Family is a substitute for an English version of *Kris i befolkningsfrågan* (1934) by Alva and Gunnar Myrdal. It was this book that precipitated the intense Swedish interest in population which gave rise to the Population Commission. It also provides a summary of the seventeen reports of the Commission, and of the subsequent legislative program. Part I, "Problems and Principles," includes a summary of the demographic situation, and a careful analysis of the normative and objective considerations which determined the broad principles of policy. Part II, "Provisions in Sweden," is devoted to a consideration of the ways in which the general principles of policy were applied, or to be applied, in many areas of social planning.

The fundamentals of Swedish policy are based on a carefully elaborated series of observations, inferences, and value judgments. It is shown that unless fertility rises, the Swedish population will decline progressively, and it is concluded, on the basis of close analysis, that there is no harmonious principle that would automatically yield an ultimate balance of births and deaths. If such a balance is to be obtained, it will have to be through the workings of a purposive social policy. There is a strong concensus of public opinion that such a balance is ultimately desirable. There is also a general agreement that efforts to increase the size of a family should not be made in ways that will adversely affect the quality of the population. Both considerations of quality and of conformity with existing ideals lead to the conclusion that, "Only the sanction of voluntary parenthood would fit the democratic foundations of this society" (p. 102). A positive population policy, therefore, requires the construction of a society in which parents will freely choose to have families large enough to yield an ultimate balance of births and deaths.

These principles preclude the application of many direct and simple, but coercive measures which other nations have used. They mean that, "Population policy can be nothing less than a social policy at large . . . and calls for nothing less than complete social redirection." (p. 2). It is from this point of view that Dr. Myrdal discusses as aspects of population policy such topics as: educational preparation for married life, the economics of homemaking, housing for families, problems of public and maternal health, the incomplete family, social security and the care of the handicapped, recreation and the family, and the employment of women.

Throughout, a major problem is to find means by which the state may absorb much of the economic burden of reasonably large families, for the analysis indicates that, "There exists no other cause of birth limitation comparable to the economic one." (p. 76). A fundamental conclusion of the study is that lightening of the burden should not take the form of cash benefits which are likely to favor population quantity at the expense of quality. Instead, benefits should be given directly to children and mothers in the form of medical care, adequate nutrition, housing, education, and the like. Benefits thus given by the state will substantially lessen the economic burden and promote the healthy development of the children; thus reconciling the qualitative and quantitative objectives of the program.

Dr. Myrdal develops the material admirably in a lucid, systematic, and well integrated account, which carries the an-

*MYRDAL, ALVA: Nation and Family, The Swedish Experiment in Democratic Family and Population Policy. pp. 441. Harper & Brothers, New York. 1941.

alysis from the basic principles to the details of a broad program centered on population and the family. She makes little attempt to give a critique of the program, or to estimate its likelihood of success, had the war not prevented its orderly unfolding. Although most of the book was written in the United States, "with American problems in mind," there is little explicit attention to problems outside of Sweden.

No American reader will be able to avoid speculating on the applicability of the Swedish program to his larger and more hetereogeneous nation. The reviewer is left with the impression that, even in the simpler Swedish setting, it was only the specter of a dying nation that brought the whole problem to the level of political action, and that the doctrine of quality first was a rational popular afterthought. Public interest in numbers has been diverted to a program designed to improve quality and set up the economic prerequisites for a gradual rise in fertility as the slower processes of education bring new attitudes toward the family. Can a nation facing no imminent crisis of numbers secure such an integrated social program? Or, must the attempt be delayed until a serious numerical crisis is at hand? Osborn has shown in his *Preface to Eugenics* that the essentials of a program directed to improving the quality of the population in this country do not differ greatly from those applied in Sweden. The eugenist must find the means of rallying opinion after the war to support such a program. He must do it without the aid of the depopulation shock technique which might well backfire as, fortunately, it did not in Sweden.

For the first well-rounded positive population policy suitable to a democratic society we shall long be indebted to Sweden, and particularly to Dr. Myrdal, who had an important role in its formulation and who now so ably interprets it for the English speaking audience. In the preface Dr. Myrdal recognizes the possibility that her book may "come to stand as an epitaph of a defunct society." American and English readers will finish the book with a renewed hope that the Swedish experiment will bear fruit in their own countries, and that Sweden will again lead the way through constructive experimentation toward a rational and democratic civilization.

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Progress Report on the Study of the Social and Psychological Factors Affecting Fertility

FIELD work was completed January 31 on the study of social and psychological factors affecting fertility, which was begun in Indianapolis last March. Calls were made at all the dwelling units occupied by or available for white persons (approximately 110,000) and short schedules filled out for the 55,000 married couples who were found. The data have been coded and transferred to International Business Machine punched cards. They will be analysed to obtain more information on the relation between fertility and religious preference, with allowance for differences in education, economic status and various demographic factors.

Although the above mentioned analysis in itself might justify the city-wide canvass, the primary purpose was to locate the couples meeting the requirements set up for the detailed study, namely, each spouse native white, Protestant, finished at least the eighth grade, married only once and that in 1927-29, and residing in a city of 25,000 or over at least eight years since marriage. Of 2,601 "eligible" couples located, nearly 1,200 were interviewed. Included in this number are all the couples with three or more children who would cooperate, and a stratified sample of those with fewer children. The sample was planned so as to have (1) approximately equal numbers of fecund (non-sterile) couples,

(*Continued on page* 112)

POPULATION POLICIES

And Their Objectives

D. V. GLASS

UNTIL very recently, people generally believed that population policy was a preoccupation peculiar to the totalitarian states. This is understandable since attention was mainly focused on such activities in Italy and Germany. Only in the last few years, with the increasing prominence given to Swedish legislation as an expression of a democratic form of policy, has the public begun to feel that even democracies may legitimately try to influence the growth or decline of their populations. Yet within the twentieth century, it was the democracies which first introduced positive population policies—France before the first world war, and Belgium in 1923. The authoritarian states did not come on the scene until much later—Italy in 1926 and Germany in 1933.

Nevertheless there is still a widespread feeling that to control population growth implies dictatorship. In fact, however, if we examine the course of history, we find that the desire to control or influence population increase is almost as old as civilization itself. It can be found in the Hammurabi Code of ancient Babylon (about 2080 B.C.), in Greece and in Rome. It spread through most of Europe during the Mercantilist period, with outstanding examples in the France of Colbert, in the Spain of Philip the Fourth, in Prussia under Frederick the Great, and in Austria under Maria Theresa and Joseph the Second. And if we look more closely at the policies in these countries during the Mercantilist period we can find a clear link between their measures and the measures which were introduced in Rome by Augustus between 18 B.C. and 9 A.D. In France, for example, the preamble to the Act of 1666—an Act which granted tax exemption to people who married in their youth and annual pensions to parents with large families—specifically draws attention to the Roman legislation. In Spain, the Act of 1623 granted temporary exemptions from taxation to people who married at an early age, and exemptions for life to those who had six or more male children. The Act traces a direct descent through *Las Siete Partidas,* promulgated in the 13th century and achieving the full force of the law at the beginning of the 16th century, to the local "Fueros" and the *Forum Judicum* —the Visi-Gothic Code—promulgated in the 7th century. This had its origin in the same Roman legislation to which the French Act had referred with high praise.

Repressive Nineteenth Century Policies

Nor has policy always been confined exclusively to the encouragement of population growth. In Bavaria, Württemberg, Baden, and other German states, in Austria and in parts of Switzerland, the first half of the 19th century saw, instead of the encouragement of population growth, the application in practice of the Malthusian theory. In the 17th and 18th centuries Mercantilist and Cameralist writers and statesmen generally expressed a belief that there was a positive correlation between the size of a population and economic prosperity. This was partly a reflection of the newly developing centralized sovereign states, partly because of the increasing fiscal demands of the Governments, and the relative lack of labor-saving machinery in manufacturing. But the writers and statesmen of the first half of the 19th century saw the world through spectacles of an entirely different color. They were confronted by the chaos of early industrialism, by agricultural distress which resulted partly from harvest failures, and partly from excessive subdivision of estates, by the growing burden which an inadequate poor law system laid upon the local communities,

and above all by an ever present fear of social revolution. In this situation the influence of Malthus was felt very strongly, and these 19th century statesmen translated into practice the political and economic theories of such German Malthusians as Hegewisch, Luden, K. H. Rau, and Robert Von Mohl. And even though the astonishing proposal of C. A. Weinhold for wholesale infibulation of the lower classes was regarded by his contemporaries as ludicrous, and Weinhold himself was, as he acknowledged, subjected to considerable insult in the newspapers and periodicals of the day, yet the actual policies implemented in many of the German states did not lag very far behind Weinhold's extremist ideas. Beginning from 1818, many of the Southern and Central German states passed laws which made marriage legally impossible for those who did not possess a certain minimum of property required by the local communities. Though the laws of the separate states differed in detail, there were certain common factors. Everything depended upon whether the proper authorities in the district which was the legal residence of a man who wished to marry were willing to allow the marriage, or objected to it. If no objection was raised the way to marriage was quite clear. But there often were objections, and consent to the proposed marriage was based primarily upon evidence of the man's capacity to support a wife and family, and generally covered such points as his physical ability; the possession of a necessary trade or other training; and his moral capacity — by which was generally meant that he had to show that he had received religious instruction before and after confirmation. In some states permission depended upon whether, in relation to conditions in the community or in the state in general, the man's profession would provide an adequate income; or whether he possessed enough property to insure that he would be able in the future to support a wife and family. The physical and moral state of the bride was often an important factor; even if the man were quite blameless, permission to marry could be refused if the intended bride was regarded as a bad householder. Of course, in addition to all these factors, problems of petty prejudice also complicated the question of obtaining permission to marry. In a Catholic area a Protestant would find it difficult to get permission to marry; while in a Protestant area the authorities did not look very favorably upon an application by a Catholic. There is not space here to elaborate on this Malthusian legislation and its consequences. It will suffice to say that though the legislation undoubtedly depressed the marriage rate wherever it was applied, this reduction of marriage was counterbalanced by an enormous increase in illegitimacy, in spite of the fact that concurrently with these marriage restrictions there were also laws penalizing extra-marital co-habitation and the bearing of illegitimate children.

Legislation of this kind was repealed in most German states between 1868 and 1870. But it persisted in Bavaria, though in less stringent form, until the end of the 19th century, while in some of the territories of Austria it continued well into the present century. In the Tyrol the marriage legislation was not repealed until 1921 and in the Vorarlberg the repealing Act was not passed until 1923. These measures that prevented marriage among the lower economic strata came into force primarily for economic reasons and especially to prevent social revolution — as the Minister of the Interior for Bavaria, Prince Von Oettingen-Wallerstein, said in 1834, in discussing a proposal for a new and much more stringent marriage Act, "It will close the gates to revolution." They were abandoned when it was seen that not only was the fear of over-population highly exaggerated, but that in fact the measures were anachronistic hindrances to the industrial upsurge of the second half of the 19th century.

We thus have ample evidence to show that a desire to control population growth need not be peculiar to any given social, political, or economic system. Nor need the desire take one particular

form. A state may wish to increase or to decrease the rate of population growth, depending upon its interpretation of the given circumstances. Even the absence of an explicit policy, as is the case in most of our present democracies, really implies a population policy — that of accepting the existing demographic trends. Nevertheless the population policies with which we are faced today, in both the democracies and totalitarian countries, are policies designed at least to maintain and preferably to increase the current rate of population growth.

Population-Boosting Programs

What differences then can we find between the objects of, and the measures implemented by, democratic and totalitarian states in attempting to deal with population problems in the last 20 years? Of the democratic states, the first to show population fears during our recent historical period was France, and the next was Belgium. The Scandinavian countries did not become interested until the last decade. In France the fear of a declining population was already visible after the Austro-Prussian war, and became especially marked after the result of the Franco-Prussian war threw up a new and extremely powerful Germany on the proximate horizon. Newspapers, periodicals, and books of the period were full of lamentations concerning the low fertility of France and the disadvantages that would undoubtedly result therefrom. French writers were particularly fond of quoting from the foreign press to show that other nations were already aware of French infertility. Thus, for example, it was common to quote Japanese newspapers to the effect that French population was falling and that France would soon cease to be an important power. Von Molke's statement that, because of her infertility, France was losing a battle every day, was widely cited. Dr. Rommel, whose book *Au pays de la Revanche*, published in Geneva in 1886, asserted that, because of her infertility France could not possibly win a battle, that German population pressure would soon cause Germany to look for more territory, and that Germany would need to take the relatively unoccupied French territory to fill this need. This gloomy prophesy was constantly quoted in France even up to 1937, although apparently Rommel was only the pseudonym of a French writer who had adopted the name and high-handed tone of a dogmatic German in order the better to frighten his countrymen. After the first world war statements of the same kind became increasingly prevalent, particularly as the possibility of danger from Italy was now added to the German danger. Monsieur F. Vieuille, reporting in 1925 on a conference of the German Association of Large Families, stated that, while French fathers were primarily concerned with "the desire for a greater social justice and a greater human solidarity," German fathers aimed at giving back to Germany the force with which she would be able to "slake her thirst for vengeance and domination." Nor did the prospect of having allies reduce these fears. Writers like Fernand Boverat, of the "Alliance Nationale," continually thundered that unless France raised her fertility she would lose her allies; for who would want to be allied with a country whose population was already on the verge of a decline? So from the 1860's, the dominant motive in French population policy was a desire to maintain the status quo, and a fear that this could only be done by raising fertility; that unless fertility were raised, the inevitable result would be annihilation by other and more virile powers.

And a similar motive applies to Belgium, which came into the field of population policy immediately after the first world war. Obviously Belgium could not hope by any measures to increase her population sufficiently to withstand an onslaught by the neighboring great powers. But for Belgium there was the same desire to maintain the status quo, this time induced by a fear that with a falling population, large scale immigration would be necessary, that the immigration could only come from the Slav countries, and that such an immigration would

swamp Belgium's own native culture. Even the Scandinavian countries, when they speak in terms of the economic and social consequences of a declining population, have much the same outlook as Belgium; they, too, desire to retain their system as constituted before the present war, and fear that this could not be done without raising fertility to the replacement level.

Thus the prime motive in spurring the democracies to implement a population policy has been a desire to maintain things as they were before the outbreak of this new world war. For the dictatorships, however, the ideological basis is quite different. For Italy and Germany, population policy has been primarily part of the general imperialist and expansionist policy which characterizes these countries. In Italy the thesis is quite explicit. In 1924 Mussolini drew attention to the rapid growth of the Italian population. Though he had been an ardent supporter of birth-control in 1913, he said in 1924 that he would never favor Malthusian propaganda as a means of alleviating population growth. Nor would he contemplate wars for the conquest of territories for colonization. But this attitude was soon changed. In his Ascension Day speech, on May 26, 1927, he said: "What are 40 million Italians as opposed to 90 million Germans and 200 million Slavs? . . . What are 40 million Italians as opposed to 40 million French plus the 90 millions in their colonies or to the 46 million English plus the 450 millions in their colonies? . . . Demographic power conditions the political and thus also the economic and moral power of nations. To count for something in the world Italy must have at least 60 million inhabitants when she arrives at the threshold of the second half of this century. . . . With a falling population one does not create an Empire but becomes a colony." The theory is thus quite clear. You already have over-population but you must not relieve it by means of emigration or birth-control. On the contrary you must increase it to justify your claim to colonies and to increase your power. Expand your population and you will be able to expand your territory! And this view is confirmed in an article by one of the Italian official statisticians, Mario De Vergottini, published in 1938, which argues that: "to preserve her position as a great European power and to increase her importance in Europe and in the world, [Italy] had to aim above all at an increase of her population, so as to create through her demographic expansion the basis for the territorial expansion which is necessary to enable her to maintain inside the State the natural population increase that otherwise, as in the past, would have to overflow abroad." For this reason the enactment of emigration restrictions was an early feature of the Fascist Regime. Italians might complain that the immigration quota system kept them out of the United States but on the other hand, implicit in the Fascist theory of the state and explicit in its legal practice is the prohibition of emigration except for short periods, or for specific purposes, such as in providing agricultural labor for Italy's Axis partner, Germany. Thus Signor Grandi, when Under Secretary of State for Foreign Affairs, said in 1927 that nations now calculated their power in terms of the homogeneity and size of their populations and their demographic vitality. Why should Italy still act as a kind of human fish pond to replenish countries suffering from demographic impoverishment? Why should Italian mothers continue to bear sons to serve as soldiers for other nations?

If Italian officials have one virtue, it is their frankness and explicitness. In Germany the population thesis cannot be found in such precise terms as in Italy. We may even note that Hitler, writing in *Mein Kampf*, referred to the "terrific" rate of population growth in Germany before the first World War, which meant an ever growing need for the necessities of life. And Dr. Burgdorfer, who is perhaps the best informed German official demographer and certainly one of the most cautious in his statements, has almost always referred to the German demographic aim as one of preventing a fall in the population rather than of instigating an endless growth. Nevertheless, there are many officials whose views

are, to say the least, highly pro-natalist. Dr. Braschwitz, an official in the Ministry of Justice, said in 1935 that Germany needed an annual supply of two million births in order to secure the position of her people. Given the mortality of the period, this would imply an ultimate population of almost 123 millions. Paul Danzer, writing in 1937 about the battle for births, said that the object of a population policy could not be anything else but a return to "natural" fertility, and referred to birth control as an utter fraud found only in overwrought brains. In 1933 the *Opferdienst der Deutschen Frau* asserted that the use of contraceptives means a violation of nature and a degradation of womanhood, motherhood, and love. These statements tie up very closely with the "living space" theory—which, deriving from Ratsel and the Norwegian writer Kjellen, has found its culmination in Haushofer — with the affiliated Germanic Monroe Doctrine and with the racial theory. The racial theory helps to account for the insistence upon pronatalism as a means for raising population growth, rather than, as under Frederick the Great, upon a combination of birth and immigration policy. Mercantilism at least had the merit of being in general inclusive in its population policy. But Nazi theory is necessarily exclusive for it aims at transforming the German people into a "Herrnvolk" to dominate Europe. The most clear end result of this can be seen in a speech which Goebbels made in May, 1939. He said: "It is a pity that the Western powers conduct an ostrich policy in the matter of colonies. Do they think that 50 years hence, when the 80 million Germans will be 130 million, the earth can remain distributed as at present?" At the time when Dr. Goebbels spoke, the population of Germany, including Austria, was only about 75 millions. And the latest official estimate of the future population, published in 1938, showed that, even assuming some further rise in fertility, it would be doubtful if, by 1990, the population of Germany, including Austria, would reach even 80 million. Furthermore, the German statistical office pointed out that there would have to be an additional rise in fertility of at least 20 per cent in order to maintain the supply of men in the age groups between 15 and 45 years. Dr. Goebbels may have been unjustifiably optimistic, but he was evidently visualizing the time when, as a result of Nazi policy, the population of Germany would have swollen sufficiently to justify the redistribution of colonial territories and perhaps also to provide the means to stimulate this redistribution.

For both Italy and Germany we may therefore sum up the position as follows: First, it is likely that in both countries, even before pronatalist policies had been introduced, numbers were already depressing the standards of living. Secondly, in both of these countries fertility was declining. Thirdly, in both of these countries the object of state policy was not primarily to raise the standard of living. On the contrary, in order to justify territorial expansion, the leaders were prepared to introduce measures which, by increasing the rate of population growth, would thereby probably lower the standard of living.

Similarities of Population Policies

It is evident, then, that the objects of totalitarian population policy differ very considerably from those of the democratic states. But when we come to look at the actual measures implemented we cannot, with the exception of Sweden, find any fundamental differences. We have already noted that modern totalitarian policy is exclusive as contrasted with the inclusive Mercantilist policy. But today not even the democracies which wish to encourage population growth show any visible desire to have large stocks of immigrants. In the 17th and 18th centuries almost every European country was not only willing, but anxious, to import foreign labor. The reception of the Huguenots by most of the German principalities, by England, and by the Scandinavian states, is an especially well known example; probably nearly 100,000 went to the British Isles, over 25,000 to Brandenburg, 6,000 to Hesse-Cassel, and various other allotments to many other countries. In addi-

tion to the Huguenot migration, Austria under Maria Theresa and Joseph the Second, and Russia, especially under Catherine the Great, initiated policies of giving free land, tax exemptions, and special privileges in order to attract immigrants. It is likely that, as a result, in the second half of the 18th century well over 200,000 immigrants went into the Austrian empire, and over 75,000 into Russia, while the immigration into Brandenburg was at least as high as that into Austria. But of the modern democracies the only one prepared to accept immigrants in large numbers was France, and even in this case it was much more a question of immediate necessity than of choice.

Large-scale immigration being excluded, both the democracies and the totalitarian states have necessarily emphasized the stimulation of fertility, and the measures adopted fall into the broad categories of (1) propaganda to encourage marriage and parenthood; (2) the use of repressive measures to discourage individual control of conception and childbearing; and (3) the granting of cash and other allowances — usually rather low in value — as a reward for, or as a contribution towards, the cost of raising children. But the measures are both piecemeal and static. They are piecemeal because, with the exception of Sweden, none of the countries concerned has looked at the population question as a whole, and developed a coherent plan of attack upon it. They are static because, either implicitly or explicitly, they assume that the main cause of the decline in fertility lies in the inability of the family to adjust itself to changed economic and social conditions. They therefore strive, either by repressive legislation or through economic and other inducements directed at the individual and the family, to bring the family back to an earlier biological level. Even in Sweden, where a coherent plan has been evolved, based explicitly on the encouragement of voluntary parenthood, the object is to "reintegrate the family in society" instead of to reconstruct a society to which the family has adjusted itself only too well. Legislators have refused to recognize that the population trend is part of the economic and social environment and cannot be changed without transforming that environment. So long as they persist in this refusal we cannot expect them to undertake a realistic analysis of the population question or to provide an effective answer to it.

Fertility Study

(*Continued from page* 106)

planned as to number of children, in each parity group (i.e. having none, one, or two children); (2) in each parity group, the rental distribution of the couples interviewed the same as that of all "eligible" couples, and (3) the sampling ratios of a parity-rental group approximately the same in each census tract. These requirements were met quite closely with one exception. Due largely to the high proportion (roughly 65 per cent) of childless couples classified as sterile, fewer schedules were completed for fecund couples whose family size was planned and who were childless, than for those who had one or two children.

Although the schedules were lengthy (requiring for fecund couples three interviews averaging four and one-half hours altogether), and many of the questions extremely personal, a high degree of cooperation was secured. Over 92 per cent of the "eligible" couples contacted gave the information requested.

The coding of the schedules is now going on at the offices of the Scripps Foundation, Oxford, Ohio, and should be completed in about eight months.

The study is being conducted by a Committee of populationists and psychologists composed of Lowell J. Reed (chairman), Daniel Katz, E. Lowell Kelly, Clyde V. Kiser, Frank Lorimer, Frank Notestein, Frederick Osborn, S. A. Switzer, Warren S. Thompson, and P. K. Whelpton. It is being financed chiefly by grants from the Carnegie Corporation. P. K. Whelpton is director of field work and coding.

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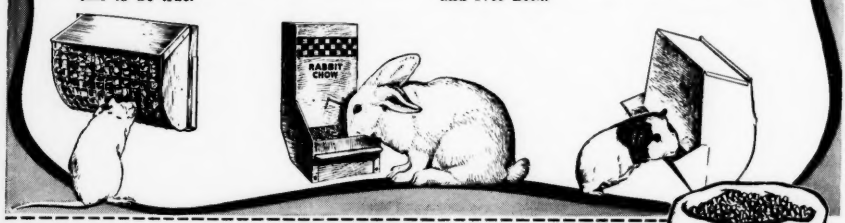

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